Analysis on Development Status of Children's Programming Education and its Satisfaction Research

Taking Hangzhou as an example

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Abstract: As the economy develops, children's programming education has gradually entered people's vision. Based on the data of questionnaire survey, this paper makes a descriptive analysis of the development status of children's programming education. We also studied students' satisfaction with children's programming education. On the basis of confirmatory factor analysis, we obtained a comprehensive indicator to evaluate respondents' overall satisfaction with children's programming education. Through the analytic hierarchy process to determine the weight of each indicator, the satisfaction scale and evaluation system of children's programming education were constructed.

Keywords: Children's programming education; Confirmatory factor analysis; Analytic hierarchy process; Satisfaction evaluation system.

1. Introduction

With the rapid development of the national economy, China's household income has been significantly improved, and the investment in education has been continuously enhanced. Regular teaching in schools can no longer meet the diverse and deep needs of society, parents and students. With the arrival of artificial intelligence era, the importance of programming is self-evident. In recent years, National Olympiad in informatics, youth computer robot competition and other competitions have set off an unprecedented upsurge in children's programming in the field of education.

Through the research on children's programming education [1], this paper conducted a questionnaire survey in eight urban areas of Hangzhou, established statistical models, and conducted a quantitative analysis on the impact of policies on citizens and their support for policies.

2. Research Objects

The research object of this paper is primary and middle school students in Hangzhou. We distributed a total of 900 questionnaires in eight urban areas of Hangzhou, and eventually recovered 874 valid questionnaires, with an effective rate of 97.98%.The reliability and validity of the questionnaire were analyzed by means of statistical software to ensure the sample quality.

3. Descriptive Analysis of Development Status

We analyzed the development status of children's programming education in Hangzhou reflected by the effective questionnaires collected, from the result of programming learning or not, the programming learning time frequency statistics. Starting from the data, combined with actual life experience and descriptive analysis about the present situation of the development of children's programming education.

3.1. Analysis of programming learning or not

A survey of 874 students from different districts in Hangzhou found that 556 said they had taken programming courses, accounting for nearly two-thirds of the respondents. This shows that students in different areas of Hangzhou have realized the importance of children's programming education, and they begin to learn children's programming gradually.

3.2. Analysis of programming learning time

Through the investigation on the learning time, we find that students mainly learn programming for less than two years, and most learn programming for less than one year. The possible reasons are as follows: After attending the first stage of the programming, children have already mastered the basic graphical programming. The next stage of learning can be considered in two main directions. One is hardware programming, open-source hardware such as robotics or raspberry PI. Another direction is information contests or code class programming. Open-source hardware involves more electrical know-

ledge, which is difficult for primary school students; Code programming requires more time andmore mathematics, so it's suitable for senior students. However, at this time, they are under great pressure to enter higher school and have little time to devote to programming learning [2].Therefore, at present, the curriculum continuity of children's programming education is insufficient, and only suitable for learning the curriculum system for several years.

4. Establish Satisfaction Evaluation System based on Confirmatory Factor AHP

4.1. Build the satisfaction evaluation system based on confirmatory factor analysis

According to the 13 factors in the satisfaction scale, we refer to professional knowledge and classify them according to the common sense. However, since the artificial regulations are largely influenced by subjective factors, we need to conduct tests to ensure their rationality. We sorted out the data collected in the questionnaire and imported them into AMOS for confirmatory factor analysis [3]. If the fitting index is not up to standard, we adjust the structure of satisfaction slightly. After several adjustments, we established secondary indicators as follows: programming curriculum, education effectiveness, teaching environment and learning effectiveness. The four factors are shown in the figure below:

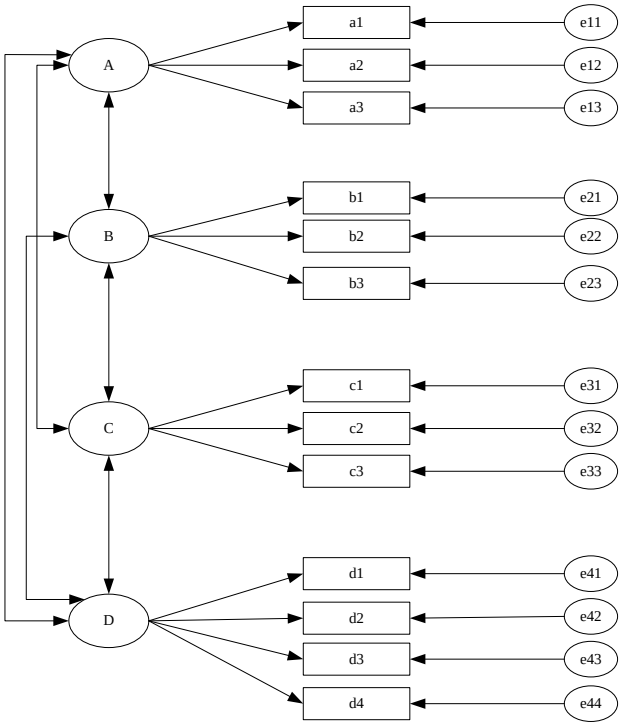

Figure 1. Schematic diagram of AMOS confirmatory factor analysis model

Table 1. Symbols that

Variable	Meaning	Variable	Meaning	Variable	Meaning
A	Programming curriculum	d1	Energy expended by study	c3	Course assessment method
B	Education effectiveness	b1	Classroom teaching atmosphere	a1	Rationality of curriculum
C	Teaching environment	b2	Teaching method flexibility	d2	Fun of learning
D	Learning effectiveness	b3	Teacher's patience	d3	Results obtained
a3	Difficulty of course	c1	Traffic convenience	d4	Life practicability
a2	Class time	c2	Course fee collection		

The test values of fitting parameters obtained by AMOS software all reached the fitting standard. Therefore, the satisfaction evaluation structure of children's programming education is reasonable.

4.2. Determine the weight of indicators at all levels based on AHP

Based on the confirmatory factor analysis, we have divided the 13 factors into four categories: programming curriculum, teacher education effectiveness, external teaching environment and student learning effectiveness, which constitute the final evaluation index of children's programming education satisfaction. However, each factor
has a different impact on the final satisfaction, so we built the hierarchical analysis model [4], and finally got the weight of each factor in the four indicators, and the weight of the four indicators in the satisfaction evaluation, so as to establish the satisfaction evaluation system.

When determining the proportion of factors influencing factors in the factors, we use the Numbers 1~9 and its reciprocal as the scale to establish the judgment matrix of each layer, and use MATLAB software to conduct the consistency test of the total hierarchical ranking. The results of the total hierarchical ranking have relatively satisfactory consistency and accept the analysis results. Therefore, a satisfaction evaluation system can be established.

In the questionnaire design, we marked "very satisfied" as 5 points, "relatively satisfied" as 4 points, "average" as 3 points, "dissatisfied" as 2 points, "very dissatisfied" as 1 point. Based on this, we calculated the average scores and evaluation scores of various measures in the scale, as shown in the following table:

Table 2. Evaluation results of various measures of satisfaction scale

Measure layer	Measure layer average score	Criterion level index	Criterion level score	Target score
a1	3.35	A	3.2161	3.1708
a2	3.19			
a3	3.19			
b1	3.32	B	3.4328	
b2	3.24			
b3	3.56			
c1	2.86	C	2.8376	
c2	2.74			
c3	3.12			
d1	3.00	D	3.1086	
d2	3.50			
d3	2.96			
d4	2.76			

As can be seen from the above table, the overall satisfaction is 3.1708, which is between average and relatively satisfactory, indicating that the overall satisfaction of hangzhou students to children's programming education is average. Among the four indicators, the satisfaction degree of programming curriculum setting is 3.2161, and the satisfaction degree of teacher education effectiveness is 3.4328, both of which are larger than the overall situation, indicating that teachers invest more in programming education and the system of programming education is gradually improving. External environment satisfaction is 2.8376 teaching, students learning satisfaction is 3.1086, are smaller than the situation as a whole, so relevant departments should intensify efforts to improve the programming education external conditions, and in a timely manner to the students and parents understand the programming problems existing in the education, accurately grasp the dynamic change students' learning, in transport, course fees, results obtained, practical aspects of life adjustment and improvement.

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